

CHAPTER 9 WATER QUALITY IMPACTS ON RELIABILITY

The Chino Basin Desalter Authority owns and operates groundwater collection wells, pipelines, pumps, reservoirs and advanced treatment facilities to extract, treat and distribute groundwater. The advanced treatment facilities of the Chino Desalters I and II include air stripping for removal of volatile organic compounds (VOC), ion exchange and reverse osmosis for removal of other contaminants (primarily nitrates and total dissolved solids-TDS). These treatment processes are state-of-the-art in water treatment and remove most of all the contaminants in water. With these advanced water treatment processes, water quality impacts on reliability are minimized by the system's ability to remove contaminants.

The reader is referred to the CBWM's 2008 State of the Basin Report released in November 2009 (available at www.cbwm.org) for a general discussion of water quality impacts on reliability of Chino Basin groundwater. Watermaster continues to monitor water quality in the basin. The 2008 State of the Basin Report indicates that the Chino Basin's water quality is very good, with better groundwater quality in the northern portion of the Basin where recharge occurs. Salinity (TDS) and Nitrate-nitrogen concentrations increase in the southern portion of the Basin.

9.1 GROUNDWATER QUALITY IN CHINO BASIN

The results of all OBMP planning efforts of IEUA and the Chino Basin Watermaster and its member agencies have emphasized the central importance of water quality. The primary challenges facing the agencies supplies, particularly in the lower Chino Basin are: (1) water quality problems, (2) future droughts, and (3) the potential for a catastrophic event that interrupts water service to the region. The intent of the 2008 OBMP State of the Basin Report is to serve as a metric for measuring OBMP implementation progress. Mitigation efforts are needed in the projected long-term planning effort to meet the future water needs within the Basin, such as:

1. Desalters: Desalination is needed to cleanup existing problems within the lower basin aquifer. Since the implementation of the OBMP in 2000, desalter pumping commenced and has progressively increased; in FY 2009/10, desalter pumping reached roughly 28,500 AFY, which is significantly higher in comparison with the last historical high FY 2007/08 of 26,577 AFY.
2. Wellhead treatment: In the mid and upper Basin, wellhead treatment of groundwater is needed where degradation has caused wells to be taken out of service due to decline in water quality.
3. Industrial plumes: Cleanup of all known existing industrial plumes is needed. In 1990, a Cleanup and Abatement Order (CAO) No. 90-134 was issued to address the groundwater contamination emanating from the Chino Airport. Monitoring wells have been installed. In 2008, the RWQCB issued an order to the San Bernardino County

Department of Airports to determine the size of the VOCs plumes in the groundwater, believed to be from the Chino Airport. The study results indicate that the plume is 3,600 feet wide by 12,100 feet long from the airport northern boundary toward the south to southwestern direction.

The aforementioned methods of water quality treatment constitute a waste of approximately 15 percent of the processed water and results in high concentrations of dissolved solids and other contaminants that require disposal.

Vigilance must be maintained regarding the water quality of imported water during drought/low yield water years to assure continued maintenance of the Basin's aquifer for future use by the agencies in the Basin and for long-term storage of water for Southern California agencies outside the Basin boundaries.

The groundwater quality in the southern portion of the Basin becomes increasingly poor south of the 60 Freeway, with high total dissolved solids (TDS) and nitrate concentrations in the southern half of the basin. Between July 2003 and June 2008, 32 percent of the wells south of Highway 60 had TDS concentrations below the secondary MCL, an improvement from the 20 percent reported in the 2006 Watermaster State of the Basin Report (from July 2001 – June 2006). Between July 2003 and June 2008, about 69 percent of the wells south of Highway 60 had Nitrate-Nitrogen concentrations greater than the MCL, which translates into an 80 percent reported in the 2006 State of the Basin Report for the period of July 2001 – June 2006. In addition, new contaminants such as VOCs, arsenic, and perchlorate have been discovered in the region threatening the future expanded use of the Chino Groundwater Basin.¹

For the most part, the groundwater quality in the northern and central portions of the Chino Basin is good and most areas meet the California Department of Health Services' (CDHS), now the California Department of Public Health (CDPH), Safe Drinking Water Standards. Chino Basin groundwater quality is discussed in detail in the Chino Basin OBMP, State of the Basin Report – 2008, November 2009². The discussion below is excerpted from the same reference and the reader is referred to this source for additional information.

In the State of the Basin Report 2008 (November 2009),⁴ Figures 9-1 through 9-19 shows all wells in the basin including those that have groundwater quality monitoring results for the period ranging from 2004 through 2008 (Figures are available at www.cbwm.org). Figure 9-1 also shows the location of the CDA desalter water supply wells and other groundwater wells with water quality data.

¹ Chino Basin OBMP, State of the Basin Report – 2008, (November 2009), Wildermuth Environmental, Inc.

² Chino Basin OBMP, State of the Basin Report – 2008, (November 2009) Wildermuth Environmental, Inc.

⁴ Chino Basin OBMP, State of the Basin Report – 2008, November 2009, Wildermuth Environmental, Inc.

Numerous water quality standards are in place and governed by Federal and State agencies. Primary “maximum contaminant levels” (MCL) are enforceable criteria established to improve human health and environmental effects. Secondary standards are related to aesthetic qualities of the water such as taste and odor.

In addition, for some chemicals there are “notification level” criteria set by the state. These notification levels have been established to meet health concerns but are not enforceable. Table 9-1 lists the constituents which exceed at least one water quality criteria for more than 10 wells in the Chino Basin groundwater for the period July 2003 through June 2008.

**Table 9-1 Constituents that Exceed MCL
in Water Wells**

<i>Inorganic Constituents</i>	
Total Dissolved Solids	221
Nitrate-Nitrogen	395
Aluminum	153
Arsenic	24
Chloride	25
Chromium	30
Iron	185
Manganese	58
Perchlorate	188
Sulfate	41
Vanadium	25
<i>General Physical</i>	
Color	21
Odor	28
pH	14
Specific Conductance	121
Turbidity	78
<i>Chlorinated VOCs</i>	
1,1-Dichloroethane	11
1,1-Dichloroethene	31
1,2,3-Trichloropropane	23
1,2-Dichloroethane	17
cis-1,2-Dichloroethene	10
Tetrachloroethene (PCE)	37
Trichloroethene (TCE)	115

Figures 9-1 through 9-19 show the Chino Basin wells with one or more sets of water quality results included in the State of the Basin Report, 2008; additionally, Figure 9-18 shows the locations of plumes in the Basin aquifer with high volatile organic compounds (VOC's). In the figures that depict distributions of water quality in Chino Basin, the convention shown in Table 9-2 was typically followed in setting the class intervals in the legend (where WQS is the applicable water quality standard). Variations from this convention may be employed to highlight certain aspects of data.

Total Dissolved Solids (TDS)

In CDPH Title 22, TDS is regulated as a secondary contaminant. The recommended drinking water maximum contaminant level (MCL) for TDS is 500 mg/L; however, the upper limit is 1,000 mg/L.

During the period from July 2003 through June 2008, maximum TDS concentrations ranged from 48 mg/L to 4,790 mg/L with an average and median concentration of approximately 550 mg/L and 380 mg/L, respectively. Figure 9-2 shows the distribution of the maximum TDS concentrations. The highest concentration located south of Route 60, where impacts from agriculture are greatest, which are caused primarily by dairy waste disposal, consumptive use, and fertilizers used in crops. TDS concentrations in the northeast part of Chino Basin range from about 170 to about 300 mg/L for the pre-1980 period with typical concentrations in the mid to low 200s. TDS concentrations in excess of 200 mg/L would indicate degradation from overlying land use. With a few exceptions, areas with either significant irrigated land use or dairy waste disposal histories overlie groundwater with elevated TDS concentrations. The exceptions are areas where point sources have contributed to TDS degradation; i.e., the former Kaiser Steel site in Fontana and the former wastewater disposal ponds near the IEUA Regional Plant No. 1 (RP-1) south of the 60 Freeway and west of Archibald Avenue in the City of Ontario, CA.

Figure 9-2 illustrates the distribution of TDS concentrations in the Chino Groundwater Basin from 2003 to 2008. In some places, wells with low TDS concentrations are found to be proximate to wells with higher TDS concentrations, suggesting a vertical stratification of water quality.

Nitrate-Nitrogen (NO₃-N)

In CDPH Title 22, nitrate is regulated in drinking water with an MCL of 10 mg/L (as Nitrogen). By convention, all nitrate values are reported in this document as nitrate-nitrogen (NO₃-N). Hence, the values of nitrate-nitrogen reported in this document should be compared with a NO₃-N MCL of 10 mg/L. Nitrate measurements in the surface water flows from the San Gabriel Mountains and in the ground water near the foot of these mountains are generally less than 0.5 mg/L. Nitrate concentrations in excess of 0.5 mg/L may indicate degradation from overlying land use. Figure 9-3 displays the distribution of maximum NO₃-N concentrations in the Chino Basin from July 2003 through June 2008.

This sampling period primarily reflects data in the southern portion of Chino Basin. The results of comprehensive monitoring indicated that about eighty-three percent of the private wells had nitrate concentrations greater than the MCL and 60 percent are more than 2.5 times greater than the MCL. As with TDS, each consecutive sampling program saw a shift toward higher nitrate concentrations. This indicates that Nitrate concentrations in groundwater have increased slightly or remained relatively constant in the northern parts of the basin from 1960 to present. These areas were formerly occupied by citrus groves and vineyards. Nitrate concentrations have increased significantly over the southern parts of the Chino-North MZ, the Chino-south MZ, the Chino-east MZ and the Prado Basin MZ. In these areas the land use has progressively been converted from irrigated/non-irrigated agricultural land to dairies, leading to nitrate concentrations exceedance over the 10 mg/L MCL and frequently exceed 40 mg/L.

The above mentioned areas are located more specifically, south of the 60 Freeway; east of the Puente and Chino Hills, south of the Jurupa Hills, along the Santa Ana River, the Temescal and Riverside Basins, and down-gradient of the former RP-1 discharge point. Several wells in the southern portion of Chino Basin have nitrate concentrations greater than the MCL.

Other Constituents of Concern

This section discusses the constituents whose water quality standards were exceeded in ten or more wells in Chino Basin (with the exception of nitrate and total dissolved solids). The details of this exceedance are displayed graphically in Figures 9-4 through 9-19. TCE, VOCs, PCE, Arsenic, Vanadium, Perchlorate, Chromium, Hexavalent Chromium, Sulfate, Chloride, Methyl-tert-butyl Ether (MTBE) are not discussed in the section that follows because standards were not exceeded in 10 or more wells. However, in the future, this constituent may be problematic, depending on the promulgation of future standards.

VOC's

The following five volatile organic compounds (VOCs) were detected at or above their MCL in more than 10 wells:

- Tetrachloroethene (PCE);
- Trichloroethene (TCE);
- 1,1-dichloroethene (1,1 DCA);
- 1,1-dichloroethene (1,1-DCE);
- 1,2 dichloroethane (1,2-DCA)
- *Cis*-1,2-dichloroethene (*cis*-1,2-DCE); and
- 1,2,3-trichloropropane.

Tetrachloroethene and Trichloroethene

PCE and TCE were/are widely used industrial solvents. PCE is commonly used in the dry-

cleaning industry. About 80 percent of all dry cleaners use PCE as their primary cleaning agent (Oak Ridge National Laboratory, 1989). TCE is commonly used for metal degreasing and as a food extractant. The distributions of PCE and TCE are shown in Figures 9-4 and 9-5 respectively. In general, PCE is below detection limits for wells in the Chino Basin. The wells with detectable levels tend to occur in clusters such as those seen around Milliken Landfill, south and west of the Ontario Airport, and along the margins of the Chino Hills. The spatial distribution of TCE resembles that of PCE. TCE was not detectable in most of the wells in the basin. Similar clustering of wells was also seen around Milliken Landfill, south and west of Ontario Airport, south of Chino Airport and in the Stringfellow plume.

Figure 9-19 shows in pie-chart format the ratio of TCE, PCE, and their break down products monitoring wells associated with the VOC plumes in the southern Chino Basin.

Dichloroethene (1, 1-DCE), 1,2-Dichloroethane (1,2-DCA) and cis-1, 2-dichloroethene (cis-1,2-DCE) are degradation by-products of PCE and TCE (Dragun, 1988) formed by the reductive dehalogenation, and their aerial distribution as shown in Figures 9-6 through 9-8 respectively. In a majority of wells in the Chino Basin, dichloroethene and cis-1,2-dichloroethene is not detected. Dichloroethene is found near the Milliken Landfill, south and west of the Ontario Airport, south of Chino Airport, at the former Crown Coach Facility and at the head of the Stringfellow plume. The compounds 1, 2-DCA and cis-1, 2-dichloroethene is found in the same general locations.

1,1-Dichloroethane (1,2-DCA)

Is a colorless oily liquid that is used as a solvent for plastics, as a degreaser, as a halon in fire extinguishers, and in the cementing of rubber, and is a degradation by-product of 1, 1, 1-TAC. Figure 9-9 shows the aerial distribution of 1, 1-DCA in the Chino Basin. Eleven wells were in exceedance of the primary CA MCL of 5-µg/L for 1, 1-DCA or the period from July 2003 through June 2008. The majority of these wells are monitoring wells at the former Crown Coach Facility.

1, 2, 3-Trichloropropane

1, 2, 3-Trichloropropane (1, 2, 3-TCP) is a colorless liquid that is used primarily as a chemical intermediate in the production of polysulfone liquid polymers and dichloropropene, synthesis of hexafluoropropylene, and as a cross linking agent in the synthesis of polysulfides. It has been used as a solvent, extractive agent, paint and varnish remover, cleaning and degreasing agent, and it has been formulated with dichloropropene in the manufacturing of soil fumigants, such as D-D.

The current California State Notification Level for 1,2,3-TCP is 0.005 micrograms per liter (µg/L). The adoption of the Unregulated Chemicals Monitoring Requirements (UCMR) regulations

occurred before a method capable of achieving the required detection limit for reporting (DLR) was available. According to CDPH, some utilities moved ahead with monitoring and the samples were analyzed using higher DLRs. Unfortunately, findings of non-detect with a DLR higher than 0.005 µg/L do not provide CDPH with adequate information needed for possible standard setting. New methodologies to analyze for 1,2,3-TCP with a DLR of 0.005 µg/L have since been developed and the DHS is requesting that any utility with 1,2,3-TCP findings of non-detect with reporting levels of 0.01 µg/L or higher do follow-up sampling using a DLR of 0.005 µg/L. Private wells monitored in 1999 through 2001 were analyzed for 1,2,3-TCP at a DLR of 50 µg/L. Because 1,2,3-TCP may be a basin-wide water quality issue, all private wells are being retested at a lower detection limit - 0.005 µg/L.

Figure 9-10 shows the distribution of 1,2,3-trichloropropane (1,2,3-TCP) in Chino Basin, based on the data limitations discussed previously, using the legend convention typically employed throughout this report. Figure 9-8 shows that the very high values of 1,2,3-TCP are associated with the Chino Airport VOC plume. In addition, there is a cluster of wells that contain 1,2,3-TCP in concentrations greater than the Notification Level north of the Chino Airport along the western margins of the basin.

Aluminum, Arsenic, Fluoride, Iron and Manganese

The concentrations of aluminum, arsenic, iron, and manganese depend on mineral solubility, ion exchange reactions, surface complexations, and soluble ligands. These speciation and mineralization reactions, in turn, depend on pH, oxidation-reduction potential, and temperature.

Iron

In general, across the Chino Basin, aluminum and iron were non-detect. However, Iron concentrations are elevated in the Stringfellow Plume. Outside of the Stringfellow Plume, there were 85 wells with concentrations greater than the MCL exceedances may be an artifact of sampling methodology – relatively high concentrations of iron, and trace metals are often the result of dissolution of aluminosilicate particulate matter and colloids caused by the acid preservative in unfiltered samples.

Arsenic

The US EPA implemented a new primary MCL for arsenic in 2006, decreasing the MCL from 50 µg/L to 10 µg/L. In November 2008, the Primary CA MCL was also changed from 50 µg/L to 10 µg/L. Figure 9-11 shows the distribution of Arsenic in the Chino Basin. Eleven wells in the Chino Basin arsenic concentrations that exceed the 2006 MCL. Only 4 wells in the basin exceeded the current MCL of 50 µg/L. Three of these wells belong are at the northern tip of the Stringfellow Plume. Higher concentrations of arsenic are found in the Chino Hills area are found at depths greater than about 350 feet below ground surface.

Vanadium

In the Chino Basin, vanadium has been detected above the regulatory limits in some scattered wells. In groundwater, vanadium can result from mining and industrial activities or be of natural occurrences. While elemental vanadium does not occur in nature, vanadium compounds are found in fossil fuels and exist in over 60 mineral ores. The primary industrial use of vanadium is in the steel industry where it is used to strengthen steel. Figure 9-12 shows the aerial distribution of vanadium in the Chino Basin. The majority of the 25 wells in exceedance of the California Notification level (0.05 mg/L) are associated with the Stringfellow Plume. Other exceedances are found near the Milliken Landfill, in deep wells in the Chino/Chino Hills area, and in one well near the Jurupa mountains.

Manganese

Manganese is a naturally occurring element that is a component of over 100 minerals. Because of the natural release of manganese into the environment by the weathering of manganese-rich rocks and sediments, manganese occurs ubiquitously at low levels in soil, water, air, and food. Manganese compounds are used in a variety of products and applications including water and wastewater treatment, matches, dry-cell batteries, fireworks, fertilizer, varnish, livestock supplements, and as precursors for other manganese compounds. Manganese is often found near landfills especially when oxidation-reduction conditions promote its mobility in groundwater. Neither manganese nor any manganese compounds are regulated in drinking water. However, the US EPA has set a secondary standard MCL of 0.05 mg/L as has California. All these standards though are non-enforceable. Most of the wells sampled for manganese have resulted in non-detect. High concentrations of manganese in groundwater have been observed along the Santa Ana River in Reach 3, scattered throughout the southern portion of Chino Basin and near the Milliken Landfill.

Perchlorate

Perchlorate has recently been detected in several wells in the Chino Basin (Figure 9-13), in other basins in California, and in other states in the West. The probable reason that perchlorate was not detected in groundwater until recently is that analytical methodologies did not previously exist that could attain a low enough detection limit. Prior to 1996, the method detection limit for perchlorate was 400 µg/L. By March 1997, an ion chromatographic method was developed with a detection limit of 1 µg/L and a reporting limit of 4 µg/L.

Perchlorate (ClO₄) originates as a contaminant in the environment from the solid salts of ammonium perchlorate (NH₄ClO₄), potassium perchlorate (KClO₄), or sodium perchlorate (NaClO₄). The perchlorate salts are quite soluble in water. The perchlorate anion (ClO₄) is exceedingly mobile in soil and groundwater environs. Because of its resistance to react with other available constituents, it can persist for many decades under typical groundwater and

surface water conditions.

Perchlorate has been detected in 188 wells in the Chino Basin at levels higher than 6 µg/L. Historical values of perchlorate exceeding the State Action Level have occurred in areas of the Chino Basin. Areas where perchlorate is found that are of interest to the CDA are (Figure 9-13).

- Downgradient of the Stringfellow Superfund Site, concentrations have exceeded 600,000 µg/L in on-site observation wells and the plume has likely reached Pedley Hills and may extend as far as Limonite Avenue.
- Rialto-Colton Basin (There is a significant perchlorate plume in the Rialto-Colton Basin. The RWQCB is investigating the source of this plume, which appears to be near the Mid-Valley Sanitary Landfill. According to the RWQCB, several companies—including B.F. Goodrich, Kwikset Locks, American Promotional Events, and Denova Environmental—operated nearby and used or produced perchlorate. These companies were located on a 160-acre parcel at T1N R5W S21 SW1/4. Denova Environmental also operated on a 10-acre lot at T1N R5W S20 S1/2. Perchlorate in the Fontana area of Chino Basin may be the result of (i) the Rialto-Colton perchlorate plume migrating across the Rialto-Colton fault, (ii) other point sources in Chino Basin, and/or (iii) the non-point application of Chilean nitrate fertilizer in citrus groves.)
- Wells in the City of Ontario water service area, south of the Ontario Airport (source[s] unknown).
- Scattered wells in the City of Chino water service area (source[s] unknown).
- City of Pomona well field (source[s] unknown)
- Scattered wells in the Montevista water service area (source[s] unknown).
- Scattered wells in the City of Chino water service area (source[s] unknown)

A forensic isotope study was conducted to determine the source of perchlorate in the Chino Basin groundwater. This forensic technique was developed using comprehensive stable isotope analyses ($^{37}\text{Cl}/^{35}\text{Cl}$ and $^{18}\text{O}/^{17}\text{O}/^{16}\text{O}$) of perchlorate to determine the origin of the perchlorate (synthetic vs. naturally occurring). Stable isotope analyses of perchlorate from known man-made (e.g. samples derived from electrochemically synthesized ammonium and potassium-perchlorate salts) and natural (e.g. samples from the nitrate salt deposits of the Atacama Desert in Chile) sources reveal systematic differences in isotopic characteristics that are related to the formation mechanisms (Bao & Gu, 2004; Böhlke et al., 2005; Sturchio et al., 2006).

There is considerable anecdotal evidence that large quantities of Chilean nitrate fertilizer were imported into the Chino Basin in the early 1900s for the citrus industry, which covered the north, west and central portions of the basin.

The perchlorate isotope study consisted of 10 groundwater samples that were collected throughout the Chino Basin. The sampling points included private wells and municipal production wells. Samples were collected using a flow-through column with a highly perchlorate-selective anion-exchange resin. The exchange resin concentrates low levels of perchlorate in groundwater such that a sufficient amount can be acquired and for isotopic analysis. Results confirmed that most of the perchlorate in the west and central portions of the Chino Basin was derived from Chilean nitrate fertilizer. One sample collected south of the OIA is a potential mixture of natural and synthetic sources.

Several types of treatment systems designed to reduce perchlorate concentrations are operating in the United States, reducing perchlorate to below the 4-ppb quantization level. Biological treatment and ion (anion) exchange systems are among the technologies that are being used, with additional treatment technologies under development.

Total Chromium and Hexavalent Chromium

Figure 9-14 shows the areal distribution of total chromium in the Chino Basin. Thirty wells were found to be in exceedance of the CA MCL of 50 µg/L. The majority of these wells are associated with the Milliken Sanitary Landfill, the Stringfellow Plume, and the GE Test Cell Plume. The remaining wells include isolated wells near the Jurupa Mountains and in the southern Chino Basin and City of Pomona wells. Chromium in groundwater results from natural and anthropogenic sources.

Hexavalent chromium is currently regulated under the MCL for total chromium. In 1999, the CDPH identified that hexavalent chromium needed an individual MCL, and concerns over its carcinogenicity grew. Subsequently, the CDPH included it on the list of unregulated chemicals that require monitoring. California Health and Safety Codes (§116365.5 and §1163659a) compelled the adoption of a hexavalent chromium MCL by January 1, 2004, and required it to be close to the public health goals (PHG) established by the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA). At present, the PHG has not been established, and the CDPH cannot proceed with the MCL process.

Figure 9-15 shows the areal distribution of hexavalent chromium in the Chino Basin. Only three wells in the Chino Basin were in exceedance of the CA MCL for total chromium. In the near future hexavalent chromium may become a more significant contaminant of concern in the Chino Basin when a lower MCL is determined by CDPH, and more wells are sampled for hexavalent chromium.

Chloride and Sulfate

Chloride and sulfate both exceeded secondary MCLs. As discussed previously, secondary MCLs apply to chemicals in drinking water that adversely affect its aesthetic qualities and are not based on the direct health effects associated with the chemical. Chloride and sulfate are major anions associated with TDS. All wells in the basin had detectable levels of sulfate (Figure 9-16), but most had concentrations that were less than 125 mg/L (one-half the water quality standard). A total of 41 wells had concentrations at or above the sulfate secondary MCL. In general, these wells are distributed in the southern portion of the basin, in the Stringfellow Plume, and along the margins of the Chino Hills. All wells had detectable levels of chloride (Figure 9-17), but most had concentrations that were less 125 mg/L (one-half the MCL). The secondary MCL for chloride was exceeded in 25 wells; almost all of which are located in the southern portion of the basin.

Odor, Color and Turbidity

In the period from 2003 through 2008, color, odor and turbidity have been detected above their secondary MCLs in more than 10 wells within the Chino Basin; these parameters are monitored purely for aesthetic reasons and should not substantially impair water quality in the Chino Basin.

9.2 POINT SOURCES OF CONCERN

The water quality discussion above described water quality conditions across the entire basin. The discussion below describes the water quality plumes associated with known point source discharges to groundwater. Figure 9-18 shows the locations of various point sources and associated areas of water quality degradation. Figure 9-19 shows the VOC plumes and features pie charts that display the relative percent of TCE, PCE, and other VOCs detected at groundwater wells within plume impacted areas. The pie charts demonstrate the chemical differentiation between the VOC plumes in the southern portion of Chino Basin.

Alumax Aluminum Recycling Facility

Between 1957 and 1982, an 18-acre aluminum recovery facility was operated in the City of Fontana. The byproducts of aluminum recycling are aluminum oxide wastes and brine water. During this 25-year period, solid wastes were stockpiled onsite. Process water containing sodium and potassium chloride salts was discharged onsite and allowed to percolate into native soil and groundwater. Discharge ceased in 1982, and the solid wastes were removed in 1992.

Onsite groundwater monitoring was initiated in 1993 by then owner Alumax, Inc. The site was subsequently capped to prevent the future mobilization of salts offsite. Alcoa Davenport Works (Alcoa) purchased Alumax in 1998.

Currently, there are two onsite monitoring wells: MW-1 is located in the northeast corner of the property, and MW-2 is located in the southwest corner. These wells have steel casings and have experienced chloride corrosion and extensive accumulation of iron hydroxide scale.

Rehabilitation efforts in 2001 failed to adequately clear the well screens. Both wells subsequently experienced partial casing constrictions or screen collapses. In 2007, it was discovered that over ten feet of iron oxide scale and sediment had accumulated in the bottom of MW-1. MW-2 was abandoned and replaced in 2008 as it could no longer be sampled. Offsite monitoring began with the construction of four monitoring wells (AOS-1, AOS-2, AOS-3, and AOS-4) between 1999 and 2000. These wells are all located down-gradient of the site and were constructed of PVC in an effort to avoid the scale and corrosion experienced at the onsite wells. In April 2008, the RWQCB stated that Alcoa would no longer be required to monitor offsite monitoring wells AOS-1, AOS-2, and AOS-3 unless elevated levels of salts were detected at up gradient well AOS-4 (RWQCB, 2008). Alcoa is currently evaluating the ownership transfer of wells AOS-1, AOS-2, and AOS-3 to Watermaster to allow for continued monitoring.

The plume emanating from the Alumax site is characterized by elevated concentrations of sulfate, nitrate, chloride, potassium, and sodium. Consequently, the TDS concentrations at the onsite wells are high, ranging from about 500 mg/L to over 2,000 mg/L. Offsite monitoring has yielded observed TDS concentrations that range from about 100 mg/L to 700 mg/L. Note that these TDS values are higher than those observed at up-gradient wells, which typically range from 200 to 300 mg/L.

Chino Airport

The Chino Airport is located approximately four miles east of the City of Chino and six miles south of Ontario International Airport, and occupies an area of about 895 acres. From the early 1940s until 1948, the airport was owned by the federal government and used for flight training and aircraft storage. The County of San Bernardino acquired the airport in 1948 and has operated and/or leased portions of the facility ever since. Since 1948, past and present businesses and activities at the airport include modification of military aircraft, crop dusting, aircraft-engine repair, aircraft painting, stripping and washing, dispensing of fire-retardant chemicals to fight forest fires, and general aircraft maintenance. The use of organic solvents for various manufacturing and industrial purposes has been widespread throughout the airport's history (RWQCB, 1990). From 1986 to 1988, a number of groundwater quality investigations

were performed in the vicinity of Chino Airport. Analytical results from groundwater sampling revealed the presence of VOCs above MCLs in six wells down-gradient of Chino Airport. The most common VOC detected above its MCL is TCE. TCE concentrations in the contaminated wells ranged from 6.0 to 75.0 µg/L.

Figure 9-4 and 4-18 show the approximate aerial extent of TCE in groundwater in the vicinity of Chino Airport at concentrations exceeding its MCL in the period from July 2003 through June 2008. The plume is elongate in shape, up to 3,600 feet wide and extends approximately 12,100 feet from the airport's northern boundary in a south to southwestern direction. During the period from July 2003 through June 2008, the maximum TCE concentration in groundwater detected at an individual well within the Chino Airport plume was 970 µg/L.

In 1990, Cleanup and Abatement Order (CAO) No. 90-134 was issued to address groundwater contamination emanating from the Chino Airport. During 2003, five groundwater monitoring wells were installed onsite; and in 2005, an additional four groundwater monitoring wells were installed onsite for further characterization. During June and July of 2006, Watermaster conducted a focused sampling event of 25 wells within the vicinity of the Chino Airport plume. In 2007, the San Bernardino County Department of Airports began to focus their investigation on offsite characterization of the plume. In 2008, the RWQCB issued a CAO (No. R-8 2008-0064) to the San Bernardino County Department of Airports, in order to define the lateral and vertical extent of the VOCs in groundwater, and to prepare a remedial action plan. In late 2008, nine offsite monitoring wells were completed in three locations. Initial sampling of these wells was done in August 2009.

California Institute for Men

The California Institute for Men (CIM) located in Chino is bounded on the north by Edison Avenue, on the east by Euclid Avenue, on the south by Kimball Avenue, and on the west by Central Avenue. CIM is a state correctional facility and has been in existence since 1939. It occupies approximately 1500 acres – about 2,000 acres are used for dairy and agricultural uses and about 600 acres are used for housing inmates and related support activities (Geometric Consultants, 1996). The Heman G Stark Youth Correctional Facility occupies the eastern portion of the property (Geomatrix Consultants, 2005).

In 1990, PCE was detected at a concentration of 26 µg/L in a sample of water collected for a CIM drinking water supply well. Analytical results from groundwater sampling indicated that the most common VOCs detected in groundwater underlying CIM were PCE and TCE. The maximum PCE concentration in groundwater detected at an individual monitoring well (MW-7) was 1990 µg/L, and the maximum TCE concentration in groundwater detected at an individual monitoring well (MW-6) was 160 µg/L (Geomatrix Consultants, 2007). Other VOCs detected included carbon

tetrachloride, chloroform, 1,2-DCE, bromodichloromethane, 1,1,1-trichloroethane (1,1,1-TCA), carbon tetrachloride, chloroform, and toluene.

In 1992, construction began on a groundwater monitoring network of approximately 40 wells. These wells were sampled intermittently through 2007. An Interim Remedial Measure (IRM) was implemented to resume production at Well 1, treat extracted water to reduce VOC concentrations, and use that water as part of the CIM potable water distribution system. Since the implementation of the IRM, the concentrations of PCE and TCE in groundwater have decreased considerably. Of the 39 wells sampled in 2007, 6 wells in the shallow aquifer had PCE concentrations in exceedance of the MCL, and TCE was detected at one shallow monitoring well (Geomatrix Consultants, 2007). CIM submitted a Request for No Further Action (NFA) for groundwater PCE remediation to the RWQCB.

Figure 9-18 shows the approximate aerial extent of VOCs in groundwater at concentrations exceeding MCLs as of 2008. The plume is up to 2,900 feet wide and extends about 5,800 feet from north to south as figure 9-19 illustrates. The CIM plume is primarily characterized by PCE. From July 2003 to June 2008, the maximum PCE and TCE concentrations in groundwater detected at an individual well within the CIM plume were 57 µg/L and 26 µg/L, respectively.

Crown Coach

The former Crown Coach site, located at 13799 Monte Vista Ave in the City of Chino, was used by the General Electric Corporation (GE) for the manufacturing and maintenance of semi-tractors and buses from the early 1970s onward. In 1987, it was discovered that twelve underground storage tanks were leaking lube oils, diesel, antifreeze, waste oil, and waste solvents.

All 12 tanks were removed by 1988, and the release of spent solvents in the underlying soil and groundwater was reported (Rosengarten Smith & Associates, 1992). Since 1988, sampling at 22 monitoring wells has determined the concentration and areal extent of the VOC plume. Contaminated soil and groundwater are contained onsite. The most common VOCs detected are TCE, PCE, and 1,1-DCE, as shown in Figure 9-19.

Concurrent with groundwater monitoring, a series of remediation activities have occurred on the property. Starting in June 1990, extracted groundwater was discharged to an onsite sewer connection, operating under an industrial wastewater discharge permit. A soil-vapor extraction system was brought onsite in 1992 to address vadose zone contamination. Starting in 2005, a Dual Phase Extraction Treatment System (DPETS) was used to remediate groundwater and soil. In May 2008, Duke Realty began redevelopment activities on the property. During construction, DPETS operations ceased, and Edible Oil Solution (EOS) was injected into ten monitoring and extraction wells as a remediation replacement.

Figure 9-18 shows the approximate areal extent of VOCs in groundwater at concentrations exceeding their MCLs near the Crown Coach Facility as of 2008. The plume is approximately 500 feet in length and 250 feet wide. The last monitoring event in 2008 indicated that the lateral boundaries of the plume are decreasing, and PCE, TCE, and 1,1 DCE were not detected in deep aquifer wells (Rosengarten Smith & Associates, 2008). From July 2003 to June 2008, the maximum PCE and TCE concentrations detected at an individual well within the Crown Coach VOC plume were 182 µg/L and 125 µg/L, respectively.

In June 2009, GE submitted a report to the Regional Board evaluating the effectiveness of the EOS injections and the need for additional remedial measures. In this report GE concluded that the hydro-geologic conditions beneath the site are sufficient to protect the beneficial uses of groundwater in the regional aquifer and that no further monitoring and remediation activity is warranted at this site. A response from the Regional Board on this report is pending.

General Electric Flatiron Facility

The General Electric Flatiron Facility (Flatiron Facility) occupied the site at 234 East Main Street, Ontario, California from the early 1900s to 1982. Its operations primarily consisted of manufacturing clothes irons. Currently, the site is occupied by an industrial park. The RWQCB issued an investigative order to GE in 1987 after an inactive well in the City of Ontario was found to contain TCE and chromium above drinking water standards. Analytical results from groundwater sampling have indicated that VOCs and total chromium are the major groundwater contaminants. The most common VOC detected at levels significantly above its MCL is TCE, as shown in Figure 9-19. TCE has reached a measured maximum concentration of 5,620 µg/L. Other VOCs—including PCE, toluene, and total xylenes—are periodically detected but commonly below their MCLs (Geomatrix Consultants, 1997).

The facility's eighteen monitoring wells are part of a quarterly monitoring program that began in 1991. Remediation activities began in 1995 with RWQCB Waster Discharge Requirement Order No. 95-62 for the pump and treat of groundwater at two extraction wells, EW-01 and EW-02. The operation of the extraction wells and remediation system is also referred to as the Final Remediation Measures (FRM). Groundwater from EW-01 is treated for VOCs, and groundwater from EW-02 is treated for VOCs and chromium. The two sources of treated water join, are pipelined to the West Cucamonga Channel and ultimately to the Ely Basins, where it percolates into the Chino Basin Aquifer. In late 2009 or early 2010, an injection well and pipeline will be completed, and treated groundwater will be injected into the Chino Basin. In addition to the remediation measures discussed above, a Soil Vapor Extraction (SVE) system has been in operation since 2003 to remove VOCs from impacted soil.

Figure 9-18 shows the approximate areal extent of TCE in groundwater at concentrations exceeding the MCL as of 2008. The plume is up to 3,400 feet wide and extends about 9,000 feet south-southwest (hydraulically down-gradient) from the southern border of the site. From July 2003 to June 2008, the maximum TCE concentration detected at an individual well within the

Flatiron Facility plume was 5,620 µg/L, and the maximum total chromium concentration detected at an individual well was 485 µg/L.

General Electric Test Cell Facility

The GE Engine Maintenance Center Test Cell Facility (Test Cell Facility) is located at 1923 East Avion, Ontario, California. From 1956 to present, primary operations at the Test Cell Facility have included the testing and maintenance of commercial and military aircraft engines. Historically, hazardous waste was disposed of in dry wells. In 1987, results of a preliminary investigation indicated the presence of VOCs in soils near the dry wells. In 1991, a soil and groundwater investigation and subsequent quarterly groundwater quality monitoring showed the presence of VOCs in the soil and groundwater beneath the Test Cell Facility and that the VOCs had migrated offsite (Dames & Moore, 1996). Subsequent investigations indicated that the most common and abundant VOC detected in groundwater beneath the site was TCE. The historical maximum TCE concentration measured at an onsite monitoring well (directly beneath the Test Cell Facility) was 1,240 µg/L. The historical maximum TCE concentration measured at an offsite monitoring well (downgradient) was 190 µg/L (BDM International, 1997). Other detected VOCs include PCE, cis-1,2-DCE, 1,2-dichloropropane, 1,1-DCE, 1,1-DCA, and chloroform, among others.

A Consent Order between General Electric and CDPH was signed September 28, 1988 for groundwater and soil remediation (Docket No. 88/89-009CO). The groundwater investigation and cleanup is under the oversight of the RWQCB. Vapor extraction treatment system operations began in 1996 (Docket No. HAS 97/98-014). Quarterly monitoring and operations status reports have been submitted to the DTSC and the RWQCB since remediation commenced. Recently a study was conducted to evaluate the effectiveness of the soil remediation program. The results of this study were submitted to the DTSC in October 2008 (Geosyntec Consultants, 2008). In some regions of the facility, shallow soils have reached acceptable closure levels; however, remediation activities will continue until sufficient data can be evaluated.

Figure 9-18 shows the approximate areal extent of VOCs in groundwater at concentrations exceeding federal MCLs as of 2008. The plume is elongate in shape, up to 2,400 feet wide, and extends approximately 10,300 feet from the Test Cell Facility in a southwesterly direction. As Figure 9-19 illustrates, the GE Test Cell Facility plume is characterized primarily by TCE, PCE, cis-1,2-DCE, and 1,1-DCE. From July 2003 to June 2008, the maximum TCE and PCE concentrations in groundwater detected at an individual well within the Test Cell Facility plume were 900 µg/L and 16 µg/L respectively.

Kaiser Steel Fontana Steel Site

Between 1943 and 1983, the Kaiser Steel Corporation (Kaiser) operated an integrated steel manufacturing facility in Fontana. During the first 30 years of operations (1945-1974), a portion of the Kaiser Brine wastewater was discharged to surface impoundments and allowed to percolate into the soil. In the early 1970s, the surface impoundments were lined to eliminate percolation to groundwater (Wildermuth, 1991). In July of 1983, Kaiser initiated a groundwater investigation that revealed the presence of a plume of degraded groundwater beneath the facility. In August 1987, the RWQCB issued CAO Number 87-121, requiring additional groundwater investigations and remediation activities. The results of those investigations showed that the major constituents of release to groundwater were inorganic dissolved solids and low molecular weight organic compounds.

The wells sampled during the groundwater investigations had TDS concentrations ranging from 500 to 1,200 mg/L and TOC concentrations ranging from 1 to 70 mg/L. By November 1991, the plume had migrated almost entirely off the Kaiser site.

In 1993, Kaiser and the RWQCB entered into a settlement agreement; Kaiser was required to mitigate any adverse impacts caused by its plume at existing and otherwise useable municipal wells. Pursuant to the settlement, the RWQCB rescinded its earlier order 91-40, and Kaiser was granted capacity in the Chino II Desalter to intercept and remediate the Kaiser plume within the Chino Basin. In an effort to further characterize the plume, during 2005, a network of 22 public and private supply wells were selected for quarterly groundwater sampling for one year and annual sampling thereafter. In addition, two triple nested monitoring wells, MZ3-1 and MZ3-2, were installed between the distal edge of the plume and municipal supply wells in 2007. Well MZ3-1/3 was found to have elevated concentrations of TDS, sulfate, and TOC. Based on this finding, the Kaiser plume was extended to include this well.

Figure 9-18 shows the approximate areal extent of the TDS/TOC groundwater plume as of 2008. Based on a limited number of wells, including Kaiser monitoring wells MP-2 and KOSF, City of Ontario Wells 27 and 30, and monitoring wells MZ3-1 and MZ3-2, the plume is up to 7,000 feet wide and extends about 18,500 feet from the northeast to the southwest.

Milliken Sanitary Landfill

The Milliken Sanitary Landfill (MSL) is an inactive Class III Municipal Solid Waste Management Unit, located near the intersections of Milliken Avenue and Mission Boulevard in the City of Ontario. This facility is owned by the County of San Bernardino and managed by the County's Waste System Division. The facility operated from 1958 to 1999. Groundwater monitoring at the MSL began in 1987 with five monitoring wells as part of a Solid Waste Assessment Test (SWAT) investigation (IT, 1989). The results of this investigation indicated that the MSL had released organic and inorganic compounds to underlying groundwater. Based on this finding, the MSL conducted an Evaluation Monitoring Program (EMP) investigation. At the completion of the EMP, a total of 29 monitoring wells were drilled to evaluate the nature and extent of the groundwater impacts identified in the vicinity of the MSL (GeoLogic Associates, 1998).

Analytical results have indicated that VOCs are the major constituents of release. The most commonly detected VOCs are TCE, PCE, and dichlorodifluoromethane. Other VOCs that have been detected above MCLs include vinyl chloride, benzene, 1,1-dichloroethane, and 1,2-dichloropropane. Historically, the maximum total VOC concentration in an individual monitoring well was 159.6 µg/L (GeoLogic Associates, 1998).

Figure 9-18 shows the approximate areal extent of VOCs in groundwater at concentrations exceeding MCLs as of 2008. The plume is up to 1,800 feet wide and extends about 2,100 feet south of the MSL's southern border. As Figure 4-19 illustrates, the MSL plume is characterized by a mixture of PCE, TCE, and their degradation products. From July 2003 to June 2008, the maximum TCE and PCE concentrations detected at an individual well within the MSL plume were 12 µg/L and 8.4 µg/L respectively.

Municipal Wastewater Disposal Ponds

Historically, treated municipal wastewater was disposed of in ponds located near the current IEUA Regional Plant 1 (RP1), located in south Ontario, and the former Regional Plant 3 (RP3) disposal ponds, located in south Fontana. The ponds located just east of RP1, commonly referred to as the Cucamonga ponds, were used to dispose of untreated effluent collected by the Cucamonga County Water District (now the CVWD) and the IEUA. The RP3 disposal ponds are located on the southwest corner of Beech and Jurupa Avenues in the City of Fontana. The discharge of treated wastewater to the Cucamonga Ponds and the RP3 ponds ceased between the early 1970s and the mid-1980s. The contaminant plumes emanating from these ponds have never been characterized.

Upland Sanitary Landfill

The Upland Sanitary Landfill (USL) is located on the site of a former gravel quarry at the southeastern corner of 15th Street and Campus Avenue in the City of Upland. The facility operated from 1950 to 1979 as an unlined Class II and Class III municipal solid waste disposal site. In 1982, the entire USL disposal site was covered with a 10-inch thick, low permeability layer of sandy silt (GeoLogic Associates, 1997). Groundwater monitoring began at the USL in 1988, and there are now three onsite monitoring wells: an up-gradient well, a cross-gradient well, and a down-gradient well (City of Upland, 1998). Monitoring results indicate that the USL has released organic and inorganic compounds to underlying groundwater (GeoLogic Associates, 1997). Groundwater samples from the down-gradient monitoring well consistently contain higher concentrations of organic and inorganic compounds than samples from the up-gradient and cross-gradient wells. Historical groundwater samples have indicated that VOCs are the major constituents of release, and all three monitoring wells have shown detectable levels of VOCs. The most common VOCs detected above MCLs are dichlorodifluoromethane, PCE, TCE, and vinyl chloride. Other VOCs that have been periodically detected above MCLs include methylene chloride, cis-1,2-DCE, 1,1-DCA, and benzene. For the 1990 to 1995 period, the average total VOC concentration at the down-gradient monitoring

well was 125µg/L (GeoLogic Associates, 1997). And, for the July 2003 to June-2008 period, the maximum TCE and PCE concentrations detected at USL monitoring wells were 0.6µg/L and 3.5µg/L respectively.

Figure 9-18 shows the approximate areal extent of VOCs at concentrations exceeding MCLs as of 2008. Please note that this plume is only defined by three onsite monitoring wells. The extent of the plume may be greater than currently depicted in Figure 9-18.

VOC South Archibald Plume

A VOC plume, containing TCE, exists south of the Ontario International Airport (OIA). This plume extends approximately from State Route 60 on the north and Haven Avenue on the east to Cloverdale Road on the south and South Grove Avenue on the west. It is up to 11,300 feet wide and 20,500 feet long. By the late 1980s, the RWQCB determined TCE was present in numerous private wells in the area south of the OIA, and identified past activities at the airport as a likely source of TCE (RWQCB, 2005b). By 2005, TCE in exceedance of the CA MCL (5µg/L) was detected in 92 of the 167 private wells in the area. In July 2005, Draft CAOs were issued by the RWQCB to six parties identified as former TCE dischargers on the OIA property: Aerojet, the Boeing Company (Boeing), the Department of Defense, the Lockheed Martin Corporation (Lockheed), and the Northrop Grumman Corporation (Northrop). On a voluntary basis, Lockheed, GE, Boeing, and Aerojet are funding current investigative work on the extent and source of the TCE plume. Three triple nested monitoring wells were constructed in 2008 between the OIA and the VOC plume. A fourth well will be completed in 2009.

Final CAOs will likely be issued in the future. Watermaster has been working closely with the RWQCB and the identified parties, providing any available information to assist in the investigation. Remediation of the plume will likely be achieved using the CDA's Chino Basin Desalter I facilities. Watermaster is currently seeking a settlement with the companies to recover treatment costs associated with the VOC plume.

Figure 9-18 shows the approximate areal extent of the plume as of 2008. As Figure 9-19 illustrates, the OIA plume is characterized solely by TCE. During the July 2003 to June 2008 period, the maximum TCE concentration detected at an individual well within this plume was 38 µg/L.

Stringfellow NPL Site

One facility in the Chino Basin, the Stringfellow site, is on the current NPL of Superfund Sites. This site is located in Pyrite Canyon north of Highway 60 near the community of Glen Avon in Riverside County (see Figure 9-18). From 1956 until 1972, this 17-acre site was operated as a hazardous waste disposal facility. More than 34-million gallons of industrial waste—primarily from metal finishing, electroplating, and pesticide production—were deposited at the site (US EPA, 2001). A groundwater plume of site-related contaminants exists underneath portions of

the Glen Avon area. Groundwater at the site contains various VOCs, perchlorate, NDMA, and trace metals, such as cadmium, nickel, chromium, and manganese. In the original disposal area, soil is contaminated with pesticides, polychlorinated biphenyls (PCBs), sulfates, perchlorate, and trace metals. The original disposal area is covered by a clay cap, fenced, and guarded by security services.

Contamination at the Stringfellow site has been addressed by cleanup remedies described in four EPA RODs. Since 1986, cleanup actions have focused on controlling the source of contamination, installing an onsite pretreatment plant, the cleanup of the lower part of Pyrite Canyon, and the cleanup of the community groundwater area below Highway 60. In 1996, the DTSC assumed responsibility for the maintenance of the Stringfellow Superfund Site through a Cooperative Agreement with the USEPA. In December 2007, the DTSC submitted the Draft Final Supplemental Feasibility Study (SFS), which identified and evaluated the final remedial alternatives for cleanup. The 2007 Draft SFS is a revised version of an earlier 2000 draft; reconsideration was required after perchlorate and other new contaminants were discovered in 2001. Once finalized, the SFS will be used by the US EPA to select a final remedial strategy and prepare a draft ROD. The draft ROD is anticipated in December 2009.

Figure 9-18 shows the approximate areal extent of the Stringfellow VOC plume as of 2008. The VOC plume is elongate in shape, up to 1,500 feet wide, and extends approximately 14,500 feet from the original disposal area in a southwesterly direction. The most common VOC detected at levels above the MCL is TCE. There are approximately 70 extraction wells throughout the length of the plume, which have been effective in stopping plume migration and removing TCE contamination. South of Highway 60, there are only a few isolated areas where TCE exceeds 5µg/L (DTSC, 2008). During the 2003 to 2008 period, the maximum TCE concentration detected in the Stringfellow plume was 170µg/L.

High levels of perchlorate associated with the Stringfellow site were detected in community groundwater south of Highway 60 in 2001. Residents connected to the JCSD water service were provided bottled water, and the DTSC contracted to install water mains and hook ups at each residence. Concurrent with the SFS, the DTSC is conducting a Remedial Investigation and Feasibility Study of remedial alternatives for perchlorate in the down-gradient community area. As with TCE, the operation of the groundwater treatment system has resulted in a reduction of perchlorate. Since the discovery in 2001, perchlorate concentrations have been reduced by 30% to 50% throughout the monitored area (DTSC, 2008). Figure 9-18 shows the approximate areal extent of perchlorate concentrations exceeding the Notification Level (6 µg/L) as of 2008. The perchlorate plume is elongated in shape, up to 2,000 feet wide, and extends approximately 25,000 feet to the southwest from the original disposal area. During the 2003 to 2008 period, the maximum perchlorate concentration detected in the Stringfellow plume was 870µg/L.

9.3 CURRENT STATE OF GROUNDWATER QUALITY IN CHINO BASIN⁶

The baseline for the Initial State of the Basin is on or about July 1, 2000 – the point in time that

represents the start of OBMP implementation. This initial state or baseline is one metric that can be used to measure progress from implementation of the OBMP.

The groundwater quality in Chino Basin is generally very good, with better groundwater quality found in the northern portion of Chino Basin where recharge occurs. Salinity (TDS) and nitrate (NO_3) concentrations increase in the southern portion of Chino Basin. Between July 2003 and June 2008, 32 percent of the wells sampled south of Highway 60 had TDS concentrations below the secondary MCL, an improvement from the 20 percent reported in the 2006 State of the Basin Report (period of July 2001 through June 2006). In some places, wells with low TDS concentrations are proximate to wells with higher TDS concentrations, suggesting a vertical stratification of water quality. Between July 2003 and June 2008, about 69 percent of the wells sampled south of Highway 60 had $\text{NO}_3\text{-N}$ concentrations greater than the MCL, an improvement from the 80 percent reported in the 2006 State of the Basin Report (period of July 2001 through June 2006). However, please note that these statistical improvements may be an artifact of sampling occurrence and frequency.

Other constituents that impact groundwater quality from a regulatory or Basin Plan standpoint include certain VOCs, arsenic, and perchlorate. As previously discussed, there are a number of point source releases of VOCs in the Chino Basin that are in various stages of investigation or cleanup. There are also known point source releases of perchlorate (MVSL area, Stringfellow, etc.), and non-point source related perchlorate contamination appears to have resulted from natural and anthropogenic sources. Arsenic at levels above the WQS appears to be limited to the deeper aquifer zone near the City of Chino Hills. Hexavalent chromium, while not currently a groundwater quality issue in the Chino Basin, may become so, depending on the promulgation of future standards.

9.4 IMPACT OF WATER QUALITY ON RELIABILITY

The Chino Desalters are designed to recover contaminated groundwater and as such have a high degree of reliability. Reliability issues generally result from new unknown compounds that are discovered because of more sensitive detection limits or a plume that has migrated to an extraction well for the first time.

The Chino I Desalter had to shut down one of the initial raw water wells because of VOC contamination as the project was being initiated. The well has since come back on-line with the addition of air stripping and ion exchange at the Chino I Desalter. Any future water quality related issue is expected to be handled using a well head treatment technology such as air stripping, ion-exchange, reverse osmosis, microfiltration, ultraviolet treatment or a biological system. In addition, the Chino Basin Watermaster is actively working on remediation of known sources of pollution with the California Regional Water Quality Control Board.

⁶ CBWM OBMP, State of the Basin Report – 2008, Published November 2009.